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RECONSIDERING THE INVESTMENT–PROFIT NEXUS IN FINANCE-LED ECONOMIES: AN ARDL-BASED APPROACH

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ABSTRACT

A Post-Keynesian growth model is developed, in which financial variables are explicitly taken into account. Variants of an investment function are estimated econometrically, applying the ARDL (auto-regressive distributed lag)-based approach proposed by Pesaran *et al*. (*Journal of Applied Econometrics*, 16 (3), pp. 289–326). The econometric results are discussed with respect to a remarkable phenomenon that can be observed for some important OECD countries since the early 1980s: accumulation has generally been declining while profit shares and rates have shown a tendency to rise. We concentrate on one potential explanation of this phenomenon, which is particularly relevant for the USA and relies on a high propensity to consume out of capital income.

1. INTRODUCTION

Since the early 1980s, we can observe a remarkable phenomenon in a number of important OECD countries: while accumulation rates have generally been declining, profit shares and rates have shown a tendency to rise. Although this 'investment–profit puzzle' has received 'curiously little attention so far' (Stockhammer, 2005–6, p. 197),[1] it clearly poses a challenge to traditional Post-Keynesian theories of all provenances with their postulation of a 'double-sided [positive] relationship between the rate of profit and the rate of accumulation' (Robinson, 1962, p. 12).

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[1] See, however, Duménil and Lévy (2003), Van de Velde (2005), Cordonnier (2006) and Lavoie (2006, p. 20) for discussions of this phenomenon.

The paper therefore addresses two main questions: first, why do firms not invest their profits? Second, how can high (increasing) profit rates be compatible with low (declining) accumulation rates at the macroeconomic level? We propose one potential solution to these questions, based on an analysis of shareholder value orientation, which appears to increasingly affect accumulation dynamics in some countries. The intuition behind this is that increased shareholder influence on firms, reflected by a high dividend payout ratio, has a depressive effect on investment but a high propensity to consume of the recipients of capital income stimulates profits. The conditions for such an accumulation regime are derived analytically and then tested empirically. Although in recent years shareholder value orientation seemed to increasingly affect all industrial countries, it is most long established and particularly pronounced in the USA so that our empirical analysis mainly concentrates on this country.

In the empirical part of the paper, the ARDL (auto-regressive distributed lag)-based bounds-testing approach recently developed by Pesaran *et al.* (2001) is applied to the estimation of investment functions. As this estimation technique requires far less demanding theoretical assumptions than the traditional cointegration approach and allows for more flexible, data-driven modelling of economic dynamics, it may be seen as more compatible with open-system economics as other approaches to time-series econometrics. In particular, testing for long-run-level relationships is possible even when the order of integration of the underlying variables is unknown, thereby rendering unit root pre-testing dispensable.

The paper proceeds as follows. Section 2 gives a brief survey of some relevant 'stylized facts' on growth and distribution in France, Germany, the UK and the USA since 1960. Section 3 reviews the theoretical literature on the 'investment–profit nexus' within the Post-Keynesian tradition and discusses some empirical results obtained in earlier studies. In section 4, an extended Post-Keynesian growth model is presented and the analytical conditions for a particular accumulation regime combining a declining accumulation rate and an increasing profit rate as a result of increased shareholder value orientation are derived. The empirical analysis is provided in sections 5 and 6. Two series of regression analysis are conducted. First, standard Post-Keynesian investment functions are estimated and we find evidence of a breakdown of the investment–profit nexus in the early 1980s for France, Germany and the USA, but not for the UK. Second, for the USA, variants of our extended investment function from section 4 are estimated, and the accumulation regime combining low accumulation and high profitability is indeed found to be empirically relevant for the period since the early 1980s, assuming plausible values of the propensity to

consume out of capital income. Section 7 discusses some open questions, before section 8 concludes.

2. DISTRIBUTION AND GROWTH: STYLIZED FACTS

It has become common practice to distinguish three main periods of economic development in the advanced industrialized economies since the Second World War (see, for example, Boyer, 1990, 2000; Williams, 2000; Stockhammer, 2005–6): the first three post-war decades have been labelled the 'Fordist era',[2] or 'Golden Age of Capitalism'.[3] They were characterized by high accumulation and output growth and relatively peaceful social relations between 'labour and capital'. The years from the late 1960s/early 1970s to the early 1980s were a 'period of crises', with a sharp decline in output and capital stock growth and increasingly fierce conflict over the distribution of income. During the years from the early 1980s onwards, which are often called the 'neoliberal era',[4] economic growth could be to some extent stabilized, albeit not at rates comparable with those of the Fordist era. A distinguishing feature of this last period is the redistribution of income from wages to profits, which has been (over)compensating the redistribution in the other direction during the Fordist era and the period of crises.

Figure 1 and table 1 show that the slowdown in accumulation and output growth since the end of the Golden Age has been particularly pronounced in France and in Germany. In the USA, a similar downward trend can be observed, although the picture is more complex in this case. In particular, during the second half of the 1990s ('New Economy boom'), accumulation rates have come close to those of the late Fordist era, but the subsequent downturn brought accumulation down to a historical low point of the post-war era. The UK is an exception in some ways because it is the only of the four countries under investigation that has not experienced a declining trend of accumulation and output growth. Of course, the macroeconomic performance in this country had been considerably weaker than in the three other countries throughout the Fordist era.

From table 1 and figure 2, it is apparent as an overall trend that private enterprise profitability in terms of profit rates and profit shares first declined from the mid-1960s until the early 1980s, before recovering and peaking in

[2] The 'Fordist growth regime' has been extensively analysed within the French 'regulation school'. See Aglietta (1976) and, for a survey, Boyer (1990).
[3] A seminal analysis of the 'Golden Age' is Marglin and Schor (1990).
[4] An analysis of this era is provided by Duménil and Lévy (2001).

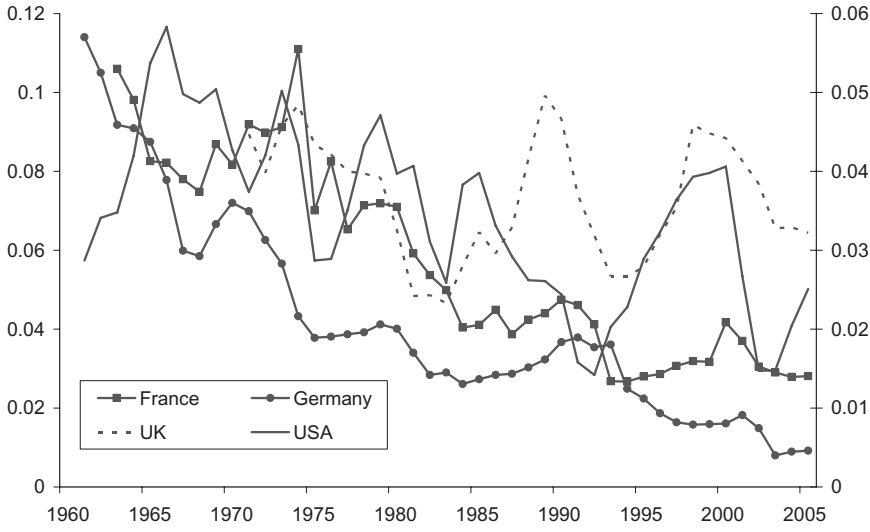

Figure 1. Accumulation rate.
Note: Growth rate of business capital stock (left scale: France, Germany).
Source: OECD Economic Outlook.

recent years. As such, this positive development of profitability despite the weak accumulation dynamics is clearly at odds with what standard Post-Keynesian theory would predict, as will be discussed in the next section.

Finally, it is worth noting that the USA differs substantially from the other three countries in terms of households' saving behaviour (see table 1). While the household savings rate has also been declining in other countries, it has fallen most considerably in the USA since the early 1980s, and has even come close to 0 per cent recently.

3. THE INVESTMENT–PROFIT NEXUS IN THE POST-KEYNESIAN LITERATURE

The most famous formulation of the investment–profit nexus in Post-Keynesian economics is the Cambridge equation:

$$r = g(r)/s_{\Pi} \tag{1}$$

which follows from the interaction of the following simple investment and savings functions:

$$g^{i} = I/K = g(r^{e}) \tag{2}$$

Table 1. Growth, distribution and household saving behaviour since 1960

	1960–74	*1975–84*	*1985–2004*
France			
Real GDP growth	5.09	2.17	2.11
Profit share	33.29	30.21	38.34
Household savings rate	17.03[a]	15.51	11.06
Germany			
Real GDP growth	4.08	2.45	2.13
Profit share	35.11	32.16	35.18
Household savings rate	12.76	12.44	11.33
UK			
Real GDP growth	2.94	1.51	2.73
Profit share	30.27	29.40	32.08
Household savings rate	6.38[b]	9.86	7.42
USA			
Real GDP growth	4.00	3.06	3.13
Profit share	29.83	32.40	34.05
Household savings rate	8.85	9.83	4.77

Source: OECD Economic Outlook.
Note: [a]1970–74; [b]1963–74.

$$g^s = S/K = s_\Pi r \tag{3}$$

with $r = \Pi/K$ = realized profit rate, $g = I/K = S/K$ = (equilibrium) accumulation rate, r^e = expected profit rate, and s_Π = propensity to consume out of profits. It is assumed that there are no savings out of labour income. In equilibrium: $r = r^e$ and for a given propensity to save out of capital income, the accumulation rate is 'a function of the rate of profit that induces it', while the profit rate is 'a function of the rate of accumulation that generates it' (Robinson, 1962, p. 48) . On one hand, investment is positively related to current profits as an indicator of future profitability and as an important source of investment finance. On the other hand, at the macroeconomic level, profits result from capitalist expenditure on investment and consumption.

Notice that, by definition,

$$r = (\Pi/Y)(Y/Y^*)(Y^*/K) = hu/v \tag{4}$$

with Y = actual output, Y^* = full capacity output. In the early Cambridge models, developed in, for example, Kaldor (1956) and Robinson (1956), the rate of capacity utilization, u, is assumed to be, in the long run, at full, or

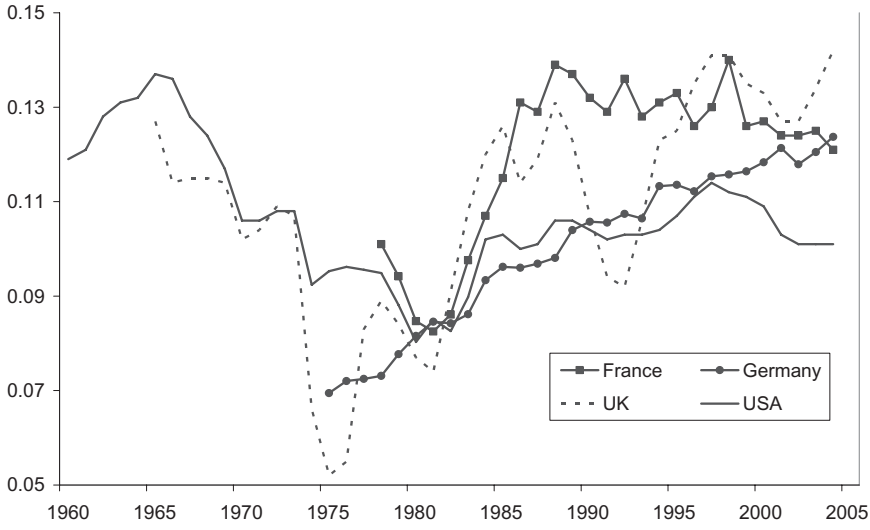

Figure 2. Rate of profit.
Source: See Appendix C.

'normal', level. Therefore, for a given capital/full capacity coefficient, v, the share of profits in national income, h, is also positively linked to accumulation and profit rates.

In the more recent Kaleckian models, the rate of capacity utilization is endogenized. However, the positive relationship between the accumulation rate and the profit rate is maintained. In the 'stagnationist' variant of the Kaleckian growth model, propagated, among others, by Rowthorn (1981), Dutt (1984) and Taylor (1985), investment decisions are positively influenced by profits and sales expectations (see also Kalecki, 1954; Steindl, 1976). The corresponding investment function can be written as

$$g^{i} = g\left(r^{e}(r, u)\right) \tag{5}$$

Combining this investment function with the savings function of equation (3) yields the 'canonical Kaleckian model' (Lavoie, 1992), where an increase in the profit share adversely affects capacity utilization, accumulation and profit rate, *ceteris paribus*.[5]

As argued by Bhaduri and Marglin (1990), the 'stagnationist' investment function effectively implies the assumption of a 'strong accelerator effect', if

[5] This is shown by Blecker (2002) for a simple linear model.

coefficients on both r and u are to be positive. Bhaduri and Marglin (1990) therefore suggest the alternative general investment function:

$$g^{i} = g\left(r^{e}(h, u)\right) \tag{6}$$

The resulting model allows for different 'regimes': accumulation can be 'wage-led' ($dg/dh < 0$) or 'profit-led' ($dg/dh > 0$), and the profit rate can be either positively or negatively affected by changes in the profit share, depending on the parameters in the savings and investment functions. However, considering equation (4), and for a given capital/full capacity ratio, v, accumulation in the Bhaduri–Marglin investment function effectively depends only on the actual rate of profit as well. In this sense, the investment–profit nexus takes an essentially similar form as in the Cambridge model.

Confronting the stylized facts presented in the previous section with the traditional Post-Keynesian models of growth and distribution, one may rather naturally conclude that the high realized rates of profit of the Fordist era are to be explained by high rates of accumulation and that high expected rates of profit brought into existence a virtuous circle of sustained economic expansion. The period of crises is characterized by falling accumulation and profit rates, which is again consistent with basic theory. Marglin and Bhaduri (1990) have argued that the decline of the Golden Age was partly due to a 'profit squeeze' faced by firms and that accumulation may have switched from 'wage-led' to 'profit-led'. First, the decline of the profit share had a direct negative impact on the profit rate from the cost side. This simultaneously deteriorated firms' expectations about the future rate of profit and thus triggered a slowdown of accumulation, which in turn also contributed to the fall of the realized profit rate.

A number of empirical works have been dedicated to the debate of profit-led versus wage-led growth, although most studies focus on aggregate demand rather than accumulation regimes. Bowles and Boyer (1995), in one of the most widely noted contributions in this field, estimate investment, savings and net export functions and find that aggregate demand in some advanced economies was indeed profit-led, at least when taking into account the impact of foreign trade. However, their period of estimation for the different equations (1953/61–1987) does not match with our periodization proposed in section 2. Comparable and more recent studies include Ederer and Stockhammer (2007), Hein and Vogel (2007) and Naastepad and Storm (2007).[6] These studies come to different conclusions about the wage-led or

[6] Bhaskar and Glyn (1995) also estimate an investment function inspired by the Bhaduri–Marglin model, but they do not interpret it in the framework of a closed macro model. For a survey on the empirical literature on distribution and growth, see Hein and Vogel (2007).

profit-led nature of different economies over different periods. One problem with these studies, however, is that they often do not conduct subsample analyses corresponding to the periodization sketched in the previous section. In particular, the diverging development of accumulation and profitability since the early 1980s remains unexplained. We argue that including financial variables into the model may give rise to a potential explanation of this phenomenon for some countries.

In the existing literature, there have been a number of theoretical attempts to consider the impact of financial variables on accumulation and aggregate demand within a Post-Keynesian framework. For the purpose of comparison with our own approach presented in the next section, it is helpful to distinguish two different global approaches.

The first type of approach can be found in models of 'finance-led growth', where investment is influenced by some argument capturing the degree of shareholder value orientation of firms. For example, in Boyer's (2000) seminal article, a 'financial norm' reflecting the profitability requirement that shareholders impose on firms is included in the investment function with a negative sign. A similar channel of shareholder influence is formalized by Stockhammer (2005–6) who postulates an objective function reflecting a 'growth–profit trade-off' faced by firms. Higher shareholder value orientation leads the firm to give a higher weight to profitability at the expense of expansion. Yet, these models emphasize the possibility of a 'virtuous system of financial growth' (Boyer, 2000, p. 127) where shareholder value orientation has a positive impact on output in the short run, based on the wealth effect on consumption.[7] In terms of Stockhammer's (2005–6) model, 'a strong (positive) effect of shareholder power on asset prices and a strong wealth effect could offset the direct (negative) effect the increase of shareholder power has on investment' (p. 209). Of course, the interest in such an outcome of finance-led capitalism was mainly due to the experience of the New Economy boom in the USA in the late 1990s, when output growth and accumulation temporarily reached remarkably high levels. But, as recognized by Stockhammer (2005–6), from a longer-term perspective, there is another and in our view more 'interesting puzzle in macroeconomic trends: the ratio of investment to profits [. . .] shows a declining trend. [. . .] (p. 197).' Nevertheless, the divergence of (falling) accumulation and (increasing) profit rates cannot be fully explained by the models mentioned above. The solution proposed by Stockhammer (2005–6) seems to be effectively based on the adding up of the 'growth–profit trade-off' for n identical firms, leading to the

[7] Aglietta (e.g. Aglietta, 2000) talks of a 'financial wealth-induced growth regime'.

conclusion that 'the increase in shareholder power will unambiguously decrease investment per profit' (p. 211). But it remains unclear how exactly the microeconomic 'growth–profit trade-off' feeds through to the macroeconomic level. As we have recalled above, the investment–profit nexus as formalized in the traditional Post-Keynesian macro models describes a *positive* relationship between investment (the accumulation rate) and profits (the profit rate).[8] Another problem with the accounts of shareholder value orientation described above is that they are difficult to test empirically, given that the 'financial norm' or 'shareholder power' is not directly observable.

There is a second type of approach to the inclusion of financial variables into Post-Keynesian models that is more closely related to the Cambridge and Kaleckian traditions discussed above. The idea is not to consider possible changes in firms' preferences due to increased shareholder power but to analyse the effects of financing constraints that arise from the distribution of profits to rentiers. The most relevant work for our purposes includes Lavoie (1995) and Hein (2006, 2007), who propose monetary extensions of the traditional 'real' Kaleckian models. The main difference between these contributions is the specification of the investment function. However, while Lavoie (1995) extends the investment function given in equation (2) and Hein (2006, 2007) those given in equations (5) and (6), respectively, their results are essentially similar. Different accumulation regimes can be derived with respect to changes in the interest rate, and both authors focus on the distinction between the 'normal case' and the 'puzzling case'. In the first case, an interest rate hike depresses both accumulation and profit rates, as usually expected, while in the second case, a rising interest rate leads to an increase in both the accumulation rate and the profit rate, *ceteris paribus*, because investment is relatively insensitive to changes in the interest rate and rentiers have a very high propensity to consume. One of the merits of Lavoie (1995) and Hein (2006, 2007) is to show that even in a Kaleckian model there can be a positive relationship between the interest rate and the profit rate, as postulated by some neo-Ricardian authors (see, for example, Panico, 1988). In our view, however, the 'normal case' and the 'puzzling case' are empirically less relevant for the period since the early 1980s than what could be called an 'intermediate case', which combines an increasing profit rate with a declining accumulation rate. Also, we will argue below that, empirically, increases in dividend payments may be linked to more important developments regarding

[8] The positive relationship between investment and profits also follows from the national accounts identity: Profits = Investment + Consumption out of capital income – Savings out of wages + Public deficit + External surplus.

investment and consumption decisions than interest rate changes, in particular in the USA since the early 1980s. This intuition also underlies the enlightening contributions of Van de Velde (2005) and Cordonnier (2006), who suggest that investment is being increasingly substituted for by shareholder consumption in the determination of macroeconomic profits.

There have also been a few attempts to estimate the effects of financial variables on investment econometrically. Hein and Ochsen (2003) estimate a linear version of a Bhaduri–Marglin type investment function extended for the interest rate as an additional regressor. They relate the estimated coefficients of the investment function to those of a savings function, in which household savings is regressed on consumption out of wages and out of interest income. However, their implied conclusions regarding the accumulation patterns in different countries and time periods do not match particularly well with our own conjectures: as an example, the 'puzzling case' is derived for the USA during 1982–95. Clearly, we would expect that increased shareholder value orientation has depressed accumulation since the early 1980s (with the exception of the New Economy boom), while consumption out of capital income has stimulated profits. Hein and Ochsen acknowledge that their results are somewhat unrealistic and that this may be due, among other things, to biased estimates of the propensity to consume out of rentier income and to insignificant coefficients in the estimated investment function.[9] Another econometric study is Stockhammer (2004). An investment function inspired by the Bhaduri–Marglin model but extended for financial variables is estimated. Financialization is proxied by a variable 'interest and dividend income/value added' (of non-financial businesses), which is included in a regression of the accumulation rate on measures of capacity utilization, the profit share and the cost of capital.[10] Stockhammer finds 'strong support for (the) hypothesis (that financialization caused a slowdown in accumulation) in the USA and France, some support in the UK, but none in Germany' (p. 739). However, Stockhammer does not interpret his results in the framework of a macro model so that no conclusions about the divergence between macroeconomic accumulation and profitability can be made. Also, while in Stockhammer (2004) financialization is proxied by interest and dividend income received by businesses, in our context it seems more appropriate to proxy shareholder value orientation by net dividend payments made by businesses.

[9] Furthermore, they argue that the estimation results may be affected by the unrealistic assumption of an interest-inelastic mark-up; see our discussion in section 7.

[10] The effects of the cost of capital are almost always insignificant and weak.

4. THE THEORETICAL MODEL

Our model is set up as follows:[11]

$$r = (\Pi/Y)(Y/Y^*)(Y^*/K) = hu/v \tag{4}$$

$$\Pi = \Pi^r + i_b K_b + i_s K_s = \Pi^r + \mathrm{INT} + \mathrm{DIV} \tag{7}$$

$$\mathrm{INTK} = i_b K_b / K \tag{8}$$

$$\mathrm{DIVK} = i_s K_s / K \tag{9}$$

$$\begin{aligned} g^s &= (\Pi - \mathrm{INT} - \mathrm{DIV} + s_b \mathrm{INT} + s_s \mathrm{DIV})/K \\ &= r - (1 - s_b)\mathrm{INTK} - (1 - s_s)\mathrm{DIVK} \end{aligned} \tag{10}$$

$$g^i = \alpha + \gamma r - \theta \mathrm{INTK} - \phi \mathrm{DIVK}, \qquad \alpha, \gamma > 0; \theta > 0; \phi > 0 \tag{11a}$$

$$g^i = \alpha + \beta u + \tau h - \theta \mathrm{INTK} - \phi \mathrm{DIVK}, \quad \alpha, \beta, \tau > 0; \theta > 0; \phi > 0 \tag{11b}$$

$$g^s = g^i \tag{12}$$

Definition (4) was given above. The profit share can be seen as exogenously given by a constant mark-up applied to unit labour costs.[12] Equation (7) decomposes total profits into profits retained by firms, Π^r, net interest payments, $i_b K_b = INT$, and net dividend payments, $i_s K_s = DIV$. Definitions (8) and (9) are introduced for computational convenience and used in the savings and accumulation functions respectively given by equations (10) and (11). According to equation (10), an increase in interest and/or dividend payments (related to the capital stock) leads to a decrease in the savings rate: retained profits are saved by definition, while rentiers consume at least part of their income. It is assumed that there are no savings out of labour income. Two variants of the accumulation function are given in equation (11). The first one can be seen either as an extension of the investment function known from the Cambridge model, or as the effective demand constraint in a Kaleckian/Steindlian model. In the latter case, the rate of capacity utilization is endogenously determined following $u = rv/h$. Therefore, we shall refer to this model

[11] For a more complete account of the theoretical underpinnings of the Kaleckian growth model, see Lavoie (1995) and Hein (2006, 2007).

[12] Formally, $p = (1 + m)wl$, where p = price, m = mark-up, w = unit wage and $1/l$ = labour productivity. Unit labour costs are assumed constant up to full capacity. Then, $h = \Pi/pY = 1 - 1/(1 + m)$.

as an extension of Lavoie's (1995) 'Minsky–Steindl model'. With the investment function given by equation (11b), the model becomes an extension of a linear Bhaduri–Marglin model, close to that developed by Hein (2007). The crucial innovation of our model is the additional variable DIVK in the savings and investment functions. The motivation behind specifying two different investment functions is that they have different respective advantages in the context of econometric estimation and can also be used for robustness checks (see section 6).

In the investment function, INTK and DIVK both reflect firms' expenditure directed to households and therefore have a negative direct effect on accumulation, as they reduce internal means of finance. In inherently imperfect capital markets, these are essential for financing investment directly and for facilitating access to external means of finance (see Kalecki's (1937) 'principle of increasing risk'). However, it is argued here that the two variables proxy rather different mechanisms concerning the governance of firms. More precisely, we expect $\phi > \theta$ and argue that an increase in DIVK (proxying shareholder value orientation), as experienced in some countries since the 1980s, should be associated with a particularly pronounced downward pressure on accumulation. This hypothesis is grounded in an extension of the Post-Keynesian theory of the firm in the context of financialization, close to that developed by Stockhammer (2004, 2005–6). Firms are assumed to face a 'growth–profit trade-off' throughout the relevant range of their investment possibilities, mainly because fast expansion is seen as giving rise to a number of technical and organizational inefficiencies at the firm level (see Lavoie, 1992, pp. 114 et seq.; Stockhammer, 2005–6). The relevant unit of analysis is the corporation operating in oligopolistic markets and where ownership and control are separated. It has traditionally been argued that the managements of such firms are typically keen on achieving power and esteem via large market shares requiring high accumulation rates (see, for example, Galbraith, 1969; Eichner, 1976; Lavoie, 1992).[13] We argue that bondholders and banks (whose influence in corporate governance is proxied by INTK in our model) are, in general, mainly concerned about the long-term viability of a firm. As expansion appears to be the best guarantee for long-term survival, they are therefore likely to passively accept or even favour managements' accumulation strategies. Quite conversely, an increase in shareholder value orientation (proxied by DIVK) is seen as favouring a firm's preference for profitability at the expense of accumulation because shareholders are over-

[13] Following Lazonick and O'Sullivan (2000), managements can be seen as advocating the strategy 'retain and invest', as opposed to shareholders' preference for the policy 'downsize and distribute'.

whelmingly interested in (short-term) returns.[14] In effect, one of the major objectives of shareholder orientation is to prevent 'overinvestment' by firms, which was seen as harming shareholder interests during the Golden Age: 'Among the manifestations of this lack of control over management were the pursuit of market share and growth at the expense of profitability [. . .]' (OECD, 1998, p. 17). Nowadays, managements are increasingly disciplined by the threat of 'mergers and the market for corporate control' (Manne, 1965), by a competitive 'market for managers' (Fama, 1980), by stock price-oriented remuneration schemes, etc. While the official objective of these measures is to reduce the 'agency costs of outsider equity' (Jensen and Meckling, 1976), there is strong empirical evidence that managers to a large extent restrain from investment projects even with a very high perceived 'net present value', because they fear a strong negative reaction of the stock market in the case of a (temporary) deterioration of earnings (e.g. Graham *et al*., 2005).

Yet, as we have recalled in the previous section, at the macroeconomic level a *higher* accumulation rate induces a *higher* profit rate, *ceteris paribus*. Clearly, the breakdown of the investment–profit nexus is so interesting because it seems to imply that the demand by shareholders for higher *micro-economic* profitability at the expense of accumulation has been realized even at the *macroeconomic* level. In our simple model of a closed economy without economic activity of the state, this is only possible through the effects of rentiers' consumption on macroeconomic profits.[15]

Formally, making use of the equilibrium condition given by equation (12), the endogenous variables of the model containing equation (11a) as the investment function can be shown to be

$$r^* = [\alpha + \mathrm{INTK}\,(1 - s_b - \theta) + \mathrm{DIVK}\,(1 - s_s - \phi)]/(1 - \gamma)$$

$$g^* = \{\alpha + \mathrm{INTK}\,[\gamma\,(1 - s_b) - \theta] + \mathrm{DIVK}\,[\gamma\,(1 - s_s) - \phi]\}/(1 - \gamma)$$

with the condition for short-run stability being $\partial g^i/\partial r < \partial g^s/\partial r \Leftrightarrow \gamma < 1$.

[14] Note that dividends are only one way for firms to distribute profits to shareholders, with equity repurchases being an (increasingly) important alternative. For a more extensive discussion, see van Treeck (2007).

[15] Unlike models of 'finance-led growth' (Boyer, 2000; Stockhammer, 2005–6), our model does not explicitly allow for consumption out of (stock market) wealth. For a more complete analysis, see van Treeck (2007).

The effects of a change in DIVK on the endogenous variables are ambiguous:

$$\frac{\partial r}{\partial \text{DIVK}} = \frac{(1-s_s-\phi)+(1-s_b-\theta)\dfrac{\partial \text{INTK}}{\partial \text{DIVK}}}{1-\gamma}$$

$$\frac{\partial g}{\partial \text{DIVK}} = \frac{\gamma(1-s_s)-\phi+\dfrac{\partial \text{INTK}}{\partial \text{DIVK}}[\gamma(1-s_b)-\theta]}{1-\gamma}$$

With the accumulation function given by equation (11b), the equilibrium values of the endogenous variables are

$$u^* = [\alpha+\tau h+\text{INTK}(1-s_b-\theta)+\text{DIVK}(1-s_s-\phi)]/(h/v-\beta)$$

$$r^* = \{h/v[\alpha+\tau h+\text{INTK}(1-s_b-\theta)+\text{DIVK}(1-s_s-\phi)]\}/(h/v-\beta)$$

$$g^* = \{h/v(\alpha+\tau h)+\text{INTK}[\beta(1-s_b)-\theta h/v] + \text{DIVK}[\beta(1-s_s)-\phi h/v]\}/(h/v-\beta)$$

with short-run stability condition $\partial g^i/\partial u < \partial g^s/\partial u \Leftrightarrow \beta < h/v$.

The marginal effects of an increase in DIVK on the endogenous variables of the model are given by

$$\frac{\partial u}{\partial \text{DIVK}} = \frac{\left[(1-s_s-\phi)+(1-s_b-\theta)\dfrac{\partial \text{INTK}}{\partial \text{DIVK}}+(\tau-u/v)\dfrac{\partial h}{\partial \text{DIVK}}\right]}{h/v-\beta}$$

$$\frac{\partial u}{\partial \text{DIVK}} = \frac{\left\{h/v\left[(1-s_s-\phi)+(1-s_b-\theta)\dfrac{\partial \text{INTK}}{\partial \text{DIVK}}\right]+\dfrac{\partial h}{\partial \text{DIVK}}(\tau h-\beta u)/v\right\}}{h/v-\beta}$$

$$\frac{\partial u}{\partial \text{DIVK}} = \frac{\beta\left[(1-s_s)+(1-s_b)\dfrac{\partial \text{INTK}}{\partial \text{DIVK}}\right]-\phi h/v+\dfrac{\partial h}{\partial \text{DIVK}}(\tau h-\beta u)/v - \dfrac{\partial \text{INTK}}{\partial \text{DIVK}}\theta h/v}{h/v-\beta}$$

Tables 2 and 3 show that the two variants of our model indeed contain the possibility of an 'intermediate case' as one potential explanation of the recent accumulation dynamics in some countries: an increase in DIVK simultaneously depresses the equilibrium accumulation rate and increases the

Table 2. Effects of dividend and interest payments in the extended 'Minsky–Steindl model' (investment function (11a))

	'Normal case'	*'Intermediate case'*	*'Puzzling case'*
	$1 - s_s < \phi$	$\phi < 1 - s_s < \phi/\gamma$	$1 - s_s < \phi/\gamma$
$\partial r/\partial$DIVK	−	+	+
$\partial g/\partial$DIVK	−	−	+
	$1 - s_b < \theta$	$\theta < 1 - s_b < \theta/\gamma$	$1 - s_b > \theta/\gamma$
$\partial r/\partial$INTK	−	+	+
$\partial g/\partial$INTK	−	−	+

Table 3. Effects of dividend and interest payments in the extended 'Bhaduri–Marglin model' (investment function (11b))

	'Normal case'	*'Intermediate case'*	*'Puzzling case'*
	$1 - s_s < \phi$	$\phi < 1 - s_s < \phi h/\beta v$	$1 - s_s > \phi h/\beta v$
$\partial u/\partial$DIVK	−	+	+
$\partial r/\partial$DIVK	−	+	+
$\partial g/\partial$DIVK	−	−	+
	$1 - s_b < \theta$	$\theta < 1 - s_b < \theta h/\beta v$	$1 - s_b > \theta h/\beta v$
$\partial u/\partial$INTK	−	+	+
$\partial r/\partial$INTK	−	+	+
$\partial g/\partial$INTK	−	−	+

equilibrium profit rate. Similar comparative statics can be derived for changes in INTK. We consider only cases featuring short-run stability. Also, we assume ∂INTK/∂DIVK = 0 and, for table 3, ∂INTK/∂h = ∂DIVK/∂h = 0. We discuss these assumptions in section 7.

5. ESTIMATION STRATEGY

In what follows, we analyse the long-run-level relationships implied by the investment functions given by equations (2), (6), (11a) and (11b) econometrically. Our main focus will be on the USA, where accumulation has indeed shown a long-term tendency to decline and where shareholder value orientation can be observed over a relatively extended period of time. However, for comparability with previous studies we also carry out estimations for the other three countries, in an attempt to illustrate the ARDL-based approach and to test the nature of the investment–profit nexus in different periods.

The specification of investment functions is notoriously difficult. As one manifestation of these difficulties, already Kalecki was 'very much concerned with the lags involved between cause and effect' (Arestis, 1992, p. 130). Of course, Kalecki did not have very sophisticated econometric techniques at his disposal and therefore, 'for the purposes of analysis, (he) incorporated an average lag between decision and implementation. Clearly, a more empirical-based approach would need to take account of different lags in different circumstances' (Sawyer, 1985, p. 53). A recent innovation in time-series econometrics, which appears to precisely fulfil this requirement, is the ARDL-based approach advanced by Pesaran *et al.* (2001, hereafter PSS). This approach allows one to test for long-run-level relationships directly from dynamic error correction models (ECMs) and has important advantages over simple partial adjustment models or the traditional cointegration approach developed by Engle and Granger (1987) and Johansen (1995, for example).

Applying the PSS approach, the following unrestricted ECMs can be derived on the basis of equations (2), (6), (11a) and (11b):

$$\Delta g_t = \alpha + \rho g_{t-1} + \lambda^r r_{t-1} + \sum_{i=1}^{p} \varphi_i \Delta g_{t-i} + \sum_{j=0}^{q} \Psi_j^r \Delta r_{t-j} + \varepsilon_t \tag{13}$$

$$\begin{aligned} \Delta g_t = {} & \alpha + \rho g_{t-1} + \lambda^u u_{t-1} + \lambda^h h_{t-1} + \sum_{i=1}^{p} \varphi_i \Delta g_{t-i} \\ & + \sum_{j=0}^{q} \left(\psi_j^u \Delta u_{t-j} + \psi_j^h \Delta h_{t-j} \right) + \varepsilon_t \end{aligned} \tag{14}$$

$$\begin{aligned} \Delta g_t = {} & \alpha + \rho g_{t-1} + \lambda^r r_{t-1} + \lambda^{\mathrm{INTK}} \mathrm{INTK}_{t-1} + \lambda^{\mathrm{DIVK}} \mathrm{DIVK}_{t-1} + \sum_{i=1}^{p} \varphi_i \Delta g_{t-i} \\ & + \sum_{j=0}^{q} \left(\psi_j^r \Delta r_{t-j} + \psi_j^{\mathrm{INTK}} \Delta \mathrm{INTK}_{t-j} + \psi_j^{\mathrm{DIVK}} \Delta \mathrm{DIVK}_{t-j} \right) + \varepsilon_t \end{aligned} \tag{15}$$

$$\begin{aligned} \Delta g_t = {} & \alpha + \rho g_{t-1} + \lambda^u u_{t-1} + \lambda^h h_{t-1} + \lambda^{\mathrm{INTK}} \mathrm{INTK}_{t-1} + \lambda^{\mathrm{DIVK}} \mathrm{DIVK}_{t-1} \\ & + \sum_{i=1}^{p} \varphi_i \Delta g_{t-i} + \sum_{j=0}^{q} \left(\psi_j^u \Delta u_{t-j} + \psi_j^h \Delta h_{t-j} + \psi_j^{\mathrm{INTK}} \Delta \mathrm{INTK}_{t-j} \right. \\ & \left. + \psi_j^{\mathrm{DIVK}} \Delta \mathrm{DIVK}_{t-j} \right) + \varepsilon_t \end{aligned} \tag{16}$$

Equations (13) and (14) are based on linear versions of the traditional investment functions underlying the Cambridge model and the Bhaduri–Marglin model and will be estimated for all countries of our sample. Estimation of

equations (15) and (16) should provide the basis for a direct test of our hypothesized 'intermediate case'. On the basis of the estimates obtained from these regressions, we will be able to make conclusions about possible accumulation regimes in terms of tables 2 and 3 for plausible propensities to save out of capital income. Unfortunately, appropriate data for INTK and DIVK were found only for the USA. But this matches well with the general impression that shareholder value orientation has been particularly pronounced in this country.

Our estimation strategy is as follows: first, unrestricted ECMs are estimated, starting with $p = q = 2$ before sequentially dropping regressors with insignificant coefficients. That is, the short-run dynamics of the model are automatically determined following statistical significance. This acknowledges the complexity of investment behaviour and can be argued to fit well into the epistemological principles advocated by many Post-Keynesians.[16] We can then make inferences about potential long-run-level relationships between the dependent and explanatory variables.

The seminal contribution by PSS has been to derive the asymptotic distribution of a test statistic (F_{PSS} statistic) which is non-standard under the null hypothesis irrespective of whether the underlying regressors are $I(0)$, $I(1)$, or mutually cointegrated. As an illustration, the null hypothesis of no long-run relationship between g, r, INTK and DIVK in equation (15) is $\rho = \lambda^r = \lambda^{\text{INTK}} = \lambda^{\text{DIVK}} = 0$. The F_{PSS} test is based on a pragmatic bounds-testing approach, and PSS have tabulated two sets of critical values, one assuming that all the regressors contain a unit root, the other assuming that they are all stationary. Whenever the F statistic falls outside the critical value bounds, valid inference can be made without making assumptions about the order of integration of the underlying variables. Extending the work by Banerjee *et al*. (1998), PSS have also tabulated upper and lower bound critical values for a t test, the null hypothesis of which is $\rho = 0$ (t_{BDM} test). If the null is rejected, estimated long-run coefficients can be obtained as $\hat{L}_r = -\hat{\lambda}^r/\hat{\rho}$, $\hat{L}_u = -\hat{\lambda}^u/\hat{\rho}$, $\hat{L}_h = -\hat{\lambda}^h/\hat{\rho}$, $\hat{L}_{\text{INTK}} = -\hat{\lambda}^{\text{INTK}}/\hat{\rho}$ and

[16] According to Gerrard (2002, p. 119), the 'LSE approach', in which ARDL modelling is grounded, can be seen as a 'radical methodology' as opposed to 'conservative, theory-driven, approaches to econometric techniques', in that it 'is founded on the presupposition that the nature of the DGP (data generating process, TvT) is not known *a priori* but has to be discovered during the modelling process' (Gerrard, 2002, p. 129). Furthermore, general-to-specific modelling implies extensive diagnostic testing, focusing in particular on serial correlation problems. In fact, the LSE approach interprets serial correlation as indicative of a specification problem, suggesting that the model may have to be respecified. In contrast, the 'conservative approach' often consists in adjusting ordinary least squares residuals for serial correlation via iterative methods or on the basis of theory-led assumptions about the autocorrelation structure (see Gerrard, 2002, p. 127).

$\hat{L}_{\mathrm{DIVK}} = -\hat{\lambda}^{\mathrm{DIVK}}/\hat{\rho}$ from the ordinary least squares estimates from equations (13)–(16), respectively. PSS have shown that the estimated long-run coefficients are T-consistent (super-consistent) and follow the limiting normal distribution, while all the short-run parameters are $\sqrt{T}$-consistent and have the standard normal distribution.

The flexibility of the approach by PSS is of invaluable utility for our matter and potentially helps to overcome a number of ambiguities affecting earlier studies on related topics. In some studies, the order of integration of the underlying variables and the related econometric issues are not explicitly discussed (e.g. Bhaskar and Glyn, 1995; Bowles and Boyer, 1995). Meanwhile, the Engle and Granger (1987) approach to cointegration, applied, for example, by Hein and Ochsen (2003), requires one to ascertain that all underlying variables are homogeneously $I(1)$ and that the regressors are not mutually cointegrated. However, as is widely recognized, the power of unit root tests is disconcertingly low (e.g. Campbell and Perron, 1991). As an illustration, we report the results of unit root tests conducted for the variables used in our estimations in Appendix A. In some cases, the order of integration is indeed ambiguous. Some variables appear to be $I(0)$ for some countries (e.g. GDP growth, used as a proxy for capacity utilization). The traditional cointegration analysis would then have to exclude these variables from the long-run-level relationship, a solution that, from the point of view of economic theory, 'at best must be deemed unconventional' [. . .]: 'The usual approach in economics is to exclude from the long-run solution only the variables whose long-run multipliers are zero, whatever their order of integrability' (Pagan and Wickens, 1989, p. 1003). The contribution by PSS thus helps to reconcile economic theory with econometric estimation. In our context, we do not have to rely on unit root pre-testing and/or controversial *a priori* judgements, e.g. 'theoretical reasons to assume that accumulation is $I(0)$ rather than $I(1)$' (Stockhammer, 2004, p. 737), and can allow for mutual (possibly only temporary) cointegration between the regressors, e.g. profits and dividends.

Definitions of the data used are reported in Appendix C, but some remarks should be made here. Notice first that variables are in current prices. This measure also underlies Stockhammer's (2005–6) formulation of the 'investment–profit puzzle' and is used in previous econometric work, e.g. Stockhammer (2004). It is justified by our focus on the determination of (current) profits by (current) capitalist expenditure, while it may produce a somewhat too negative picture of the slowdown of accumulation in the past decades from a mere productive capacity point of view (inflation has been relatively low and relative prices of investment goods may have decreased). We use yearly observations. Where possible, regressions are run with data

from a single data source. As no uniform and reliable measure of capacity utilization is available at the international level, real GDP growth is taken as a proxy. Although certainly not a perfect solution, this is common practice in investment studies (see the survey in Hein and Vogel, 2007). An obvious technical problem is the small number and low frequency of available observations. Unfortunately, this problem is difficult to overcome and intrinsic to the notion of accumulation regimes associated with historically distinct, relatively short, 'eras'. In our estimations, these eras are determined by applying the Chow test to several potential breakpoints and then choosing that with the highest test statistic.

6. REGRESSION RESULTS

6.1 What happened to the investment–profit nexus? First lessons from the traditional Post-Keynesian models

Table 4 reports the estimation results for equation (13).[17] On the basis of this very simple regression, no long-run relationship between accumulation and profit rate was found for France and Germany. For Germany, the long-run coefficient on the profit rate is even of the 'wrong' sign. In the case of the UK, where accumulation has not slowed down during the neoliberal era, the long-run coefficient on the profit rate is significant at the 10 per cent level, although this result is to be treated with caution, given the values of the t_{BDM} and the F_{PSS} test statistics. For the USA, equation (13) could be estimated over a longer period. Interestingly, the long-run coefficient on the profit rate is highly significant for the period 1965–82, while it is insignificant for 1965–2004. Somewhat surprisingly, the period 1982–2004 also features a positive long-run relationship between accumulation and profit rate. However, the long-run coefficient on the profit rate is only weakly significant and it is possible that the estimation results are dominated by the New Economy boom of the late 1990s. Indeed, when a time dummy is included for the short period 1997–2000, the investment–profit nexus breaks down, with the time dummy being highly significant and accounting for a temporary increase in accumulation of roughly 1.3 percentage points.

Equation (14) could be estimated over longer periods for most countries (see table 5). In France, a long-run relationship between the accumulation

[17] All estimations are performed with Microfit 4.1. As a matter of economy of presentation, only the long-run coefficients are reported.

Table 4. Regression results for equation (13)

	France	*Germany*	*UK*	*USA*			
	1980–2004	*1980–2004*	*1980–2004*	*1965–2004*	*1965–82*	*1982–2004*	*1982–2004*
L_r	0.34	–0.25	0.39*	0.71	0.31***	0.68*	0.045
	(0.71)	(0.79)	(1.77)	(1.44)	(3.49)	(1.79)	(0.20)
$L_{D\_97–00}$							0.013***
							(3.62)
t_{BDM}	–1.85	–1.75	–1.86	–2.17	–2.98*	–3.63**	–5.44***
F_{PSS}	4.32	1.89	3.56	2.25	4.86*	11.67***	15.12***
$\bar{R}^2$	0.34	0.16	0.58	0.58	0.61	0.75	0.84
χ^2_{Chow}				16.3 [0.01]	28.8 [0.00]		
χ^2_{SC}	1.68 [0.20]	0.20 [0.65]	14.78 [0.25]	2.33 [0.13]	0.06 [0.81]	0.01 [0.93]	0.71 [0.40]

Notes: Figures in parentheses are t values, figures in brackets are p values. Significance at the 10 per cent, 5 per cent and 1 per cent level is denoted by *, ** and ***, respectively. The critical values of the t_{BDM} test and the F_{PSS} test are taken from Pesaran *et al.* (2001). χ^2_{Chow} and χ^2_{SC} are maximum-likelihood test statistics for the null hypothesis of no structural break and of no serial correlation, respectively.

Table 5. Regression results for equation (14)

	France			*Germany*			*UK*	*USA*		
	1965–2004	*1965–83*	*1984–2004*	*1965–2004*	*1965–82*	*1983–2004*	*1980–2004*	*1965–2004*	*1965–81*	*1982–2004*
L_u	2.82***	1.49	0.83	0.61***	0.32	0.62***	0.18	0.77***	0.95*	0.62**
	(3.84)	(1.49)	(1.60)	(4.26)	(1.58)	(6.26)	(0.95)	(3.65)	(1.68)	(2.55)
L_h	−0.38	−0.27	−0.11	−0.08	0.37***	−0.45***	0.37*	−0.30	−0.46	1.30*
	(−1.32)	(−0.75)	(−0.26)	(1.15)	(3.85)	(−8.62)	(1.80)	(−1.42)	(−0.91)	(1.94)
t_{BDM}	−3.20*	−1.95	−2.51	−4.89***	−5.59***	−4.92***	−3.44**	−4.75***	−5.59***	−3.07*
F_{PSS}	10.13***	4.41*	2.28	16.74***	7.30***	10.31***	8.70***	15.26***	10.44***	13.48***
$\bar{R}^2$	0.60	0.51	0.53	0.64	0.83	0.58	0.59	0.82	0.86	0.92
χ^2_{Chow}	11.6 [0.11]	5.52 [0.13]		13.3 [0.04]	29.5 [0.00]			16.32 [0.04]	26.7 [0.00]	
χ^2_{SC}	0.74 [0.39]	0.11 [0.74]	0.09 [0.76]	0.02 [0.88]	3.91 [0.05]	3.16 [0.08]	0.59 [0.44]	1.00 [0.32]	1.33 [0.25]	0.47 [0.49]

Note: Significance at the 10 per cent, 5 per cent and 1 per cent level is denoted by *, ** and ***, respectively.

rate and the explanatory variables is detected for the whole period[18] and the subperiod 1965–83, but it breaks down in the last subperiod. Notice also that the coefficient on the profit share is insignificant (and furthermore of the 'wrong' sign) in all periods so that profit-led accumulation in the sense of Bhaduri and Marglin (1990) does not seem likely. In Germany there is a relatively strong positive relationship between the profit share and accumulation during 1965–82, but this breaks down in the early 1980s, as expected. In the UK, the profit share is positively related to accumulation in 1980–2004.[19] As for the USA, a strong accelerator effect is indicated for all periods. The coefficient on the profit share is insignificant and has the 'wrong sign' for the periods 1965–2004 and 1965–81, so that 'profit squeeze' in the sense of Bhaduri and Marglin (1990) does not appear as a major cause of the slowdown of accumulation in these periods. However, the large positive coefficient on the profit share for the period 1982–2004 is somewhat surprising, even if it is only marginally significant. Again, the results may be dominated by the investment boom of the late 1990s, although experimentation with a time dummy did not yield substantially different results.

It is not attempted to derive quantitative conclusions regarding the profit-led or wage-led nature of economies in particular periods of time. In effect, Appendix B shows that many of our regressions are affected by the problem of unstable equilibria, a problem encountered also by Hein and Ochsen (2003). This problem may in part be due to GDP growth being only a rough proxy of capacity utilization, on which β is the coefficient. Also, the estimated coefficients may be biased as a consequence of the omission of relevant (in our context, financial) variables.[20] However, our regressions do give some evidence that accumulation has been positively affected by the profit share in the UK during the neoliberal era, while this is clearly not the case for Germany and France. As for the USA, the coefficient on the profit share appears unrealistically high in 1982–2004. In the next subsection, it is attempted to produce a more realistic picture of recent accumulation dynamics in the USA and to propose a potential solution to the 'investment–profit puzzle', based on our model of shareholder value orientation.

[18] In this regression, a linear time trend was included. Without the time trend, the absolute values of the coefficients are (even) higher, while sign and significance of the coefficients remain unaffected.

[19] For the UK, equations (13) and (14) were also estimated for the period 1971–2004, but this did not yield statistically significant results.

[20] There may also be more fundamental reasons for instability. For a systematic assessment of the stability conditions in Post-Keynesian models of growth and distribution, see Dallery (2007) who concludes that 'the most plausible models are unstable' (p. 1).

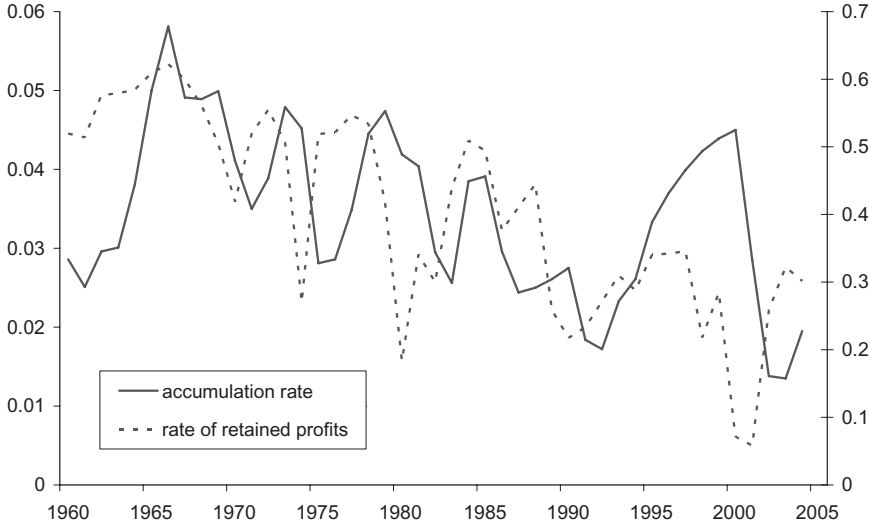

Figure 3. Accumulation rate and rate of retained profits, private corporations, USA.
Note: Net capital formation/fixed assets (left scale) and profits after tax, net interest and dividend payments/net operating surplus.
Source: NIPA (BEA).

6.2 Is our 'intermediate case' realistic? Evidence for the USA

Financialization has led to a number of remarkable changes in the US economy over the past decades. Figures 3 and 4 give support to our conjecture that an increase in the share of profits distributed to rentiers is linked to the slowdown in accumulation and that distributed profits have increasingly fuelled household consumption. Notice that private corporations distributed almost 100 per cent of profits in some years while households' savings rate has dropped to almost 0 per cent recently. The private savings rate started falling in the early 1980s, just when the rentier income share heavily increased. US national account statistics show that, while interest payments have heavily increased around the year 1980, throughout the late 1980s and the 1990s rentier income was spurred by rapidly increasing dividend payments.

The estimation results for equation (15) in table 6 are very interesting. The fit of the regression over the whole period is substantially improved compared with the estimation results from equation (13). There is also strong evidence of a long-run-level relationship and all long-run coefficients are highly significant. While the Chow test indicates that there may not have been a structural break in the early 1980s, including a time dummy for the period

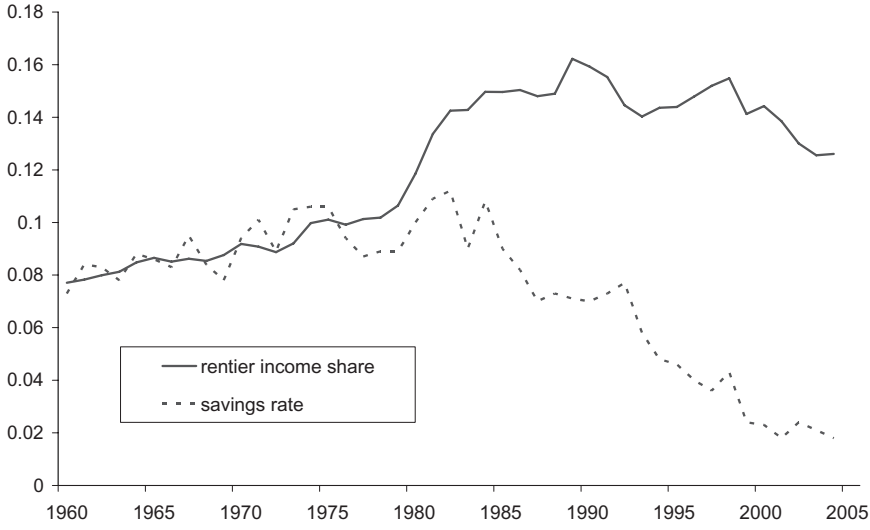

Figure 4. Rentier income share and household savings rate, USA.
Note: Household net interest and net dividend income/(household net interest and net dividend income + compensation of employees) and household savings as a share of disposable income.
Source: NIPA (BEA).

1997–2000 again improves the fit and allows for some interesting interpretations. While in the first regression the coefficients on INTK and DIVK take virtually identical values, the coefficient on DIVK strongly increases when controlling for the New Economy boom, during which the dividend payout ratio exceptionally increased together with accumulation. When making conjectures about possible accumulation regimes in terms of table 2, the coefficient on the dummy variable is difficult to interpret. Therefore, and despite the result of the Chow test, the regression was also run separately for the subsample 1980–2004. Again, it is seen that the coefficient on DIVK exceeds that on INTK in absolute value. On the basis of this last regression, table 7 shows that the 'intermediate case' obtains for very plausible propensities to consume out of dividend income.

The estimation results for equation (16), reported in table 8, confirm the results from table 6.[21] The coefficient on DIVK is again strongly negative and

[21] The result of the serial correlation test is somewhat surprising, given the relatively complex lag structure underlying this regression. However, visual inspection of the residuals did not indicate persistent serial correlation problems over the (relatively short) estimation period.

Table 6. Regression results for equation (15)

	USA		
	1965–2004	*1965–2004*	*1980–2004*
L_r	0.33***	0.36***	0.60***
	(3.14)	(3.82)	(3.39)
L_{INTK}	–0.54***	–0.58***	–0.58**
	(–3.07)	(–3.61)	(–2.86)
L_{DIVK}	–0.55***	–0.89***	–0.73**
	(–3.19)	(–4.06)	(–2.81)
$L_{\text{D\_97–00}}$		0.01**	
		(2.22)	
t_{BDM}	–4.52**	–5.09***	–5.85***
F_{PSS}	9.70***	12.36***	11.13***
$\bar{R}^2$	0.71	0.75	0.89
χ^2_{Chow}	11.5 [0.24]		
χ^2_{SC}	0.11 [0.74]	0.03 [0.87]	0.12 [0.91]

Note: Significance at the 10 per cent, 5 per cent and 1 per cent level is denoted by *, ** and ***, respectively.

Table 7. Effects of an increase in DIVK in the extended 'Minsky–Steindl model' (1980–2004)

'Normal case'	*'Intermediate case'*	*'Puzzling case'*
$1 - s_s < 0.73$	$0.73 - s_s < 1.22$	$1 - s_s > 1.22$

Note: The three cases are defined as in table 2.

exceeds that on INTK in absolute value during the neoliberal era. As the equilibrium obtained from this regression is stable (see Appendix B), we can again derive intervals for the propensities to save out of capital income yielding different accumulation regimes (see table 9). Again, the 'intermediate case' appears to be perfectly realistic, although the conditions for the different regimes in tables 7 and 9 differ somewhat.

Finally, notice that our analysis potentially gives an explanation to the phenomenon of the so-called New Economy boom of the late 1990s: the investment boom during this period, observed together with a high rate of distributed profits, may correspond simply to a temporary shift from the 'intermediate case' to the 'puzzling case'. Interestingly, a careful study by Maki and Palumbo (2001) finds, for the period of the 1990s, that the sharp drop in the overall personal savings rate in the USA can be accounted for by

Table 8. Regression results for equation (16)

	USA	
	1965–2004	*1982–2004*
L_u	0.52***	0.26***
	(3.91)	(3.57)
L_h	–0.03	0.24*
	(–0.31)	(1.84)
L_{INTK}	–0.41***	–0.46*
	(–3.45)	(–1.88)
L_{DIVK}	–0.38**	–0.62**
	(–2.04)	(–2.09)
t_{BDM}	–4.76**	–6.82***
F_{PSS}	17.51***	30.49***
$\bar{R}^2$	0.91	0.96
χ^2_{Chow}	17.3 [0.24]	
χ^2_{SC}	0.87 [0.35]	6.21 [0.01]

Note: Significance at the 10 per cent, 5 per cent and 1 per cent level is denoted by *, ** and ***, respectively.

Table 9. Effect of an increase in DIVK in the extended 'Bhaduri–Marglin Model' (1982–2004)

'Normal case'	*'Intermediate case'*	*'Puzzling case'*
$1 - s_s < 0.62$	$0.62 < 1 - s_s < 0.76$	$1 - s_s > 0.76$

Note: The three cases are defined as in table 3.

the increased propensity to consume of the highest income quintile alone. Noting further that the richest income quintile held between 80 and 90 per cent of corporate equity in the 1990s (Maki and Palumbo, 2001, p. 24) and that capital gains from rising equity prices add to shareholders' wealth and thus potentially to the ability and willingness to consume, the 'puzzling case' may indeed become possible in times of a booming stock market and euphoric consumption behaviour. Duménil and Lévy (2003, p. 22) summarize the nature of such an accumulation regime to the point: 'This is really a spending spree within the richest fraction of the population, the same people who benefit from the new flows of income and the rise of the stock market.' Similarly, during times of widespread euphoric expectations about future profits, due, for instance, to an allegedly 'new technological era', the negative

direct impact of shareholder value orientation on investment may be temporarily reduced. However, such constellations appear possible only under rather exceptional historical circumstances.

Of course, the simplicity of our model (as well as the short time series used for the estimations) should be reason of some caution regarding the exact values of the parameter estimates. Although our results do support the general conjecture that financial variables play an important role for real economic development in the USA and may in particular be linked to a weakening of the investment–profit nexus, our model remains somewhat simplistic and could be extended in a number of ways.

7. SOME OPEN QUESTIONS AND DIRECTIONS FOR FUTURE RESEARCH

To begin with, the public and foreign sectors should be included into the analysis. Clearly, public budget deficits and export surpluses could contribute to a breakdown of the investment–profit nexus (see Kalecki, 1942). On the other hand, weak domestic investment (in particular in the industrial, i.e. tradable goods sector) may affect productivity growth, and hence the trade balance, adversely (see, for example, Hersh, 2003). Another critical issue is the sustainability of the external deficit that may be linked to a low domestic savings rate in the 'intermediate' or 'puzzling' case.

Moreover, one would have to fully analyse the various possible interactions between flows and stocks in the financial and real sectors of the economy. For instance, the ratio of debt to disposable income of US households has been heavily rising during the past decades (from around 65 per cent in the early 1980s to above 120 per cent in recent years). This can in part be seen as a result of increasing financial wealth, which serves as collateral for credit, and may have contributed to a declining propensity to save, which was one of the driving forces of the New Economy boom and recent growth dynamics in the USA. However, a likely effect of rising household indebtedness would be that the savings rate eventually needs to increase again in the long run to cover interest payments and debt repayments (Bhaduri *et al.*, 2006). This would then have adverse effects on output growth and accumulation, *ceteris paribus*. Besides, the relationship between rentiers' interest and dividend claims and the overall share of profit in national income should be analysed. In fact, it may well be the case that firms succeed to raise their mark-ups when facing increased interest rates or dividend claims (see Hein, 2006, 2007 for a theoretical discussion). Similarly, one could also analyse interactions between the dividend/capital ratio and the interest/capital ratio.

It may in effect be necessary for firms to finance dividend payments (or equity repurchases) partly by bank credit, so that higher leverage and interest payments (and their effects on accumulation) would in part be an indirect effect of shareholder value orientation. Likewise, one would need to analyse the effects of stock market capital gains and losses resulting from households' portfolio decisions and firms' stock market interventions (in particular, equity repurchases are an important alternative to dividend payments as a way of distributing profits to shareholders). In an attempt to take these complex interactions into account, at least at a theoretical level, van Treeck (2007) has developed a synthetic stock-flow consistent model of financialization, following the general framework advanced by Lavoie and Godley (2001–2).

Finally, the impact of technological and structural change on accumulation, profits and output growth should be considered. Aglietta (2000), among many others, argues that the dynamics of accumulation are significantly affected by the declining costs of investment due to innovations in information technology, the increasing importance of human capital relative to physical capital and the decline of the industrial sector relative to the services sector. However, many economists are sceptical about the idea of 'growth without investment'. For instance, Rajan (2006) argues that investment in information technology is subject to very high depreciation rates and hence needs to be frequently renewed. Furthermore, much of the employment created in the services sector consists of so-called 'bad jobs', contributing to the decline in the share of wages in national income. Arguably, higher physical accumulation would have allowed for better jobs for many employees. An important part of the profits and jobs created in the services sector also arises from financial activities, where physical investment plays a less prominent role than in the industrial sector. According to US national accounts, the ratio of financial sector profits to non-financial sector profits, after being roughly constant at around 20 per cent during 1960–80, has since rapidly increased to achieve record highs of around 70 per cent in the early 2000s. However, all profits must have some 'real' economic counterpart, and we have argued above that this can be increasingly found in (capitalist) consumption expenditure. In support of this hypothesis, numerous studies show that a large part of financial sector profits in the USA in past years arose from the rapid expansion of (consumer) credit allowed for by the stock market and housing booms that increased households' collateral, even among lower-income groups (for an overview, see Chancellor, 2005). Of course, this makes consumption, profits, jobs and household solvability highly vulnerable to negative changes in equity and housing prices.

8. CONCLUDING REMARKS

In their famous analysis of the decline of the Golden Age, Marglin and Bhaduri (1990, pp. 184–185) argued that higher profitability was a precondition for the recovery of investment and growth in the developed industrialized countries. The essential conclusions of their analysis were '(a) to recognise the present need for profitability, (b) the ultimate desirability of making accumulation independent of profitability, and (c) to provide a bridge from here to there'.

Ironically, it appears today that financialization may play a role in 'making profitability independent of accumulation'. More specifically, consumption out of capital income (and wealth) seems to have increasingly replaced investment as a source of macroeconomic profits, particularly in the USA.[22] Our results suggest that the increasing profit share and rentier income share have not favoured accumulation during the past decades. The so-called New Economy boom of the late 1990s was an exception in this respect and may be interpreted in terms of our model as a temporary shift to the 'puzzling case'. In general, however, the accumulation dynamics of recent times seem to entail important risks for future economic development.

While these conclusions are primarily relevant for the USA, further research is necessary to substantiate our results and to better understand the 'investment–profit puzzle' at an international level.

Finally, we have also highlighted the usefulness of the ARDL-based approach for the estimation of investment functions.

[22] With reference to a traditional dictum, one could argue that 'capitalists (still) get what they spend', but their expenditure involves less positive externalities for society than during the Golden Age.

APPENDIX A: UNIT ROOT (AUGMENTED DICKEY–FULLER (ADF)) TESTS

		t-statistic of ADF(p) test			
		p			
Country	*Variable*	*1*	*2*	*3*	*4*
France	*g* (trend)	–2.12	–2.30	–2.81	–2.12
	r	–1.69	–2.66*	–4.29***	–4.84***
	u	–2.48	–2.10	–1.99	–1.81
	h	–2.06	–2.19	–2.55	–2.74*
Germany	*g* (trend)	–3.58**	–3.23*	–3.12	–3.02
	r	–4.89***	–2.53	–4.00**	–3.70**
	u	–5.27***	–3.64**	–3.24*	–3.21*
	h	–1.71	–1.36	–1.35	–1.33
UK	*g*	–2.97**	–3.28**	–3.34**	–2.89*
	r	–2.16	–1.38	–0.97	–1.36
	u	–5.25***	–4.04***	–3.80***	–2.77*
	h	–2.16	–1.56	–1.33	–1.43
USA	*g* (trend)	–4.62***	–3.06	–3.72**	–3.49*
	r	–2.35	–2.23	–2.48	–2.43
	u	–5.27***	–4.64***	–4.30***	–3.45**
	h	–2.35	–2.20	–2.34	–2.42
	INTK	–1.91	–1.96	–1.98	–1.92
	DIVK	0.14	–0.16	–0.05	–0.27

Notes: With a few exceptions due to data availability, tests are performed for the period 1965–2004. Rejection of the null hypothesis of a unit root at the 10 per cent, 5 per cent and 1 per cent level is denoted by *, ** and ***, respectively. For all variables for which the null hypothesis cannot be rejected, there is strong evidence of first-difference stationarity. The ADF test requires one to specify whether or not the underlying variable follows a linear time trend. While this is often difficult to ascertain, it may significantly affect the conclusions to be drawn from the ADF regression.

APPENDIX B: STABILITY IN THE BHADURI–MARGLIN TYPE MODELS

	Equation (14): Stability if $s_\Pi h/v - \beta > 0$[a]		*Equation (16): Stability if* $h/v - \beta > 0$	
	Period	$s_\Pi h/v - \beta$	*Period*	$h/v - \beta$
France	1965–2004	$0.23s_\Pi - 2.82 < 0$		
	1965–83	$0.17s_\Pi - 0 > 0$		
	1984–2004	$0.33s_\Pi - 0 > 0$		
Germany	1965–2004	$0.17s_\Pi - 0.61 < 0$		
	1965–82	$0.14s_\Pi - 0 > 0$		
	1983–2004	$0.22s_\Pi - 0.62 < 0$		
UK	1980–2004	$0.32s_\Pi - 0 > 0$		
USA	1965–2004	$0.20s_\Pi - 0.77 < 0$	1965–2004	$0.20 - 0.52 < 0$
	1965–81	$0.13s_\Pi - 0.95 < 0$	1982–2004	$0.32 - 0.26 > 0$
	1982–2004	$0.32s_\Pi - 0.62 < 0$		

Notes: [a]For a derivation of this stability condition, see Hein (2004, p. 196).
The values for β are obtained from tables 5 and 8 in the text, respectively. Insignificant coefficients are set equal to zero. Values for h and v are calculated from OECD Economic Outlook. The capital/full capacity ratio, v, is proxied by the average value of the ratio of nominal gross capital stock to nominal GDP, as in Hein and Ochsen (2003).

APPENDIX C: THE DATA SET

Accumulation rate (g_t)	Rate of growth of business capital stock[1]; Investment net of consumption of fixed capital[2]/fixed assets, non-residential businesses[3]
Profit rate (r_t)	Income from property and other/business capital stock[1] (for Germany); net operating surplus/net capital stock, non-financial corporations[4]; net rate of return, private non-financial corporations[5]; net operating surplus[2]/private fixed assets[3]
Output growth (u_t)	Growth rate of real GDP[1,2]
Profit share (h_t)	Profit share in the business sector[1]; net operating surplus/(net operating surplus + compensation of employees)[2]
Interest/capital ratio ($INTK_t$)	Net interest payments, domestic businesses[2]/non-residential capital stock[3]
Dividend/capital ratio ($DIVK_t$)	Net dividend payments, private corporations[2]/non-residential capital stock[3]

Sources: [1]OECD Economic Outlook; [2]NIPA Tables (Bureau of Economic Analysis, USA); [3]Fixed Assets Tables (Bureau of Economic Analysis, USA); [4]French National Accounts (INSEE); [5]Blue Book (Office for National Statistics, UK).

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